

REMARKS

Claims 29-32, 34 and 35 have been amended. Claims 1-28, 33, 40, 42, 43, 48 and 50 were previously canceled. Claims 29-32, 34-39, 41, 44-47, 49, and 51-64 are currently pending in this application.

Claims 29-32, 34-35, 55-58 and 60-64 stand rejected under 35 U.S.C. § 102 as being anticipated by Xing et al. (U.S. Patent No. 6,090,697) ("Xing"). This rejection is respectfully traversed.

The claimed invention relates to an electropolished patterned metal layer formed as part of a semiconductor device. As such, independent claim 29 recites an intermediate semiconductor device structure comprising *inter alia* "an insulating layer provided over said substrate" and "an electropolished patterned metal layer provided within an opening of said insulating layer." Independent claim 29 also recites that "a top surface of said electropolished metal layer is . . . at the same level with a top surface of said insulating layer." Independent claim 29 further recites "a photoresist plug provided within said opening and over and in contact with said electropolished patterned metal layer."

Independent claim 55 recites a "container capacitor" comprising *inter alia* "a lower electrode provided within a first insulating layer, said lower electrode comprising an electropolished patterned metal layer having a bottom wall and vertical sidewalls extending rectangularly upwardly therefrom." Independent claim 55 further recites "a second insulating layer provided over said electropolished patterned metal layer and in contact with said first insulating layer" and "an upper electrode provided over said second insulating layer."

Independent claim 59 recites a "container capacitor" comprising *inter alia* "a tantalum nitride barrier conductive layer" and "a lower electrode . . . comprising an electropolished patterned metal layer." Independent claim 59 also recites that the electropolished patterned metal layer has "a bottom and vertical sidewalls extending upwardly from said bottom, said lower electrode having a thickness of approximately 100 Angstroms." Independent claim 59 further recites "a dielectric material provided over said electropolished patterned metal layer and in contact with said insulating layer" and "an upper electrode comprising doped polysilicon provided over said dielectric material."

Independent claim 60 recites a "container capacitor" comprising *inter alia* "a plurality of rectangular openings provided in said insulating layer" and "a plurality of lower capacitor electrodes provided along the bottom and sidewalls of respective ones of said rectangular openings, said lower electrodes being formed as discrete electropolished metal layers." Independent claim 60 also recites "a dielectric layer associated with each of said discrete lower electrodes, said dielectric layer being in contact with said insulating layer."

Xing relates to a "high-selectivity via etching process" that "includes the steps of: forming an etchstop layer 840 of a material selected from the group consisting of Ti--Al, Ti--Al--N, Ta--Al, Al--N, Ti--Al/Ti--N, Ti--Al--N/Ti--N, Ta--Al/Ti--N, and Ti--Al/Ti--Al--N; forming a dielectric layer over the etchstop layer; and etching the dielectric layer with a fluorine-bearing etchant." (Abstract).

The Advisory Action notes that it is permissible to claim an intermediate structure. The Advisory Action, however, asserts that the preamble "semiconductor device comprising" relates to a final structure rather than an intermediate structure. The preambles of independent claim 29 and claims 30-32, 34 and 35 depending

therefrom have been amended to more clearly indicate that these claims recite an intermediate semiconductor device structure. Accordingly, Applicant respectfully requests that the limitation "a photoresist plug provided within said opening and over and in contact with said electropolished patterned metal layer" be given patentable weight. Additionally, as Xing fails to disclose this limitation, Applicant further respectfully requests that the rejection of claims 29-32, 34 and 35 be withdrawn.

The Advisory Action also states that Applicant has not indicated how the claimed structure, specifically a structure including an electropolished patterned metal layer, is distinct from the structure of Xing, specifically layer 304 of Xing. Applicant reaffirms that the limitation "electropolished patterned metal layer" is not a product-by-process limitation, but rather a *resulting structure* having distinct and defined characteristics. The term "electropolished patterned" describes the physical characteristics of the metal layer in independent claims 29, 55, 59 and 60. It is well known in the art that electropolishing results in smoother surfaces with less damage than other conventional polishing techniques, such as chemical mechanical polishing. Therefore, an electropolished metal layer has distinct characteristics as compared to metal layers polished or etched by other means. Claim limitations which confer distinct and defined characteristics of a structure have been analyzed by the Federal Circuit in Hazani v. U.S. Int'l Trade Comm'n, for example. Hazani v. U.S. Int'l Trade Comm'n, 126 F.3d 1473, 44 USPQ2d 1358 (Fed. Cir. 1997). An "electropolished patterned metal layer," like the "chemically engraved" plate of Hazani, is a *resulting structure* having distinct and defined characteristics and not a product formed by a particular process. See also MPEP §2113 citing In re Garnero, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding that "interbonded by diffusion" was a structural limitation, and further holding that terms such as "welded," "intermixed," "ground in place," "press fitted" and "etched" can be considered structural limitations).

Xing fails to disclose, teach or suggest "an electropolished patterned metal layer," as recited in independent claims 29, 55 and 59, or "electropolished patterned metal layers," as recited in independent claim 60. For at least these reasons, withdrawal of the rejection of claims 29-32, 34-35, 55-58 and 60-64 is respectfully requested.

Claims 36-39, 41, 44-47, 49, 51-54 and 59 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Xing in view of Huang (U.S. Patent No. 6,127,260) ("Huang"). This rejection is respectfully traversed.

Independent claim 36 recites a "memory cell" comprising *inter alia* "a transistor including a gate fabricated on a semiconductor substrate" and "an electropolished patterned metal layer within an insulating layer provided over said substrate, said electropolished patterned metal layer having a thickness of about 50 to about 300 Angstroms." Independent claim 36 also recites "a container capacitor including a lower electrode, a dielectric layer over said lower electrode, and an upper electrode over said dielectric layer, said upper electrode comprising doped polysilicon." Independent claim 36 further recites that the electropolished patterned metal layer forms the lower electrode.

Independent claim 44 recites a "processor-based system" comprising *inter alia* "a container capacitor including a lower electrode and an upper electrode," the lower electrode "comprising an electropolished patterned metal layer having a thickness of approximately 50 to 300 Angstroms." Independent claim 44 also recites that "a top surface of said electropolished patterned metal layer is at the same level with a top surface of said insulating layer."

Huang teaches a method of forming a "tee shaped tungsten plug." (Title). Huang teaches that the "process allows the aspect ratio for a narrow diameter opening,

to be reduced, by utilizing a two stage opening procedure.” (Abstract). According to Huang, “[a] first stage is used to create a first narrow diameter opening, in composite insulator layers, via an anisotropic RIE procedure” and “[a]n isotropic wet etch procedure is then employed to widen the first narrow diameter opening, only in an overlying, doped silicon oxide component of the composite insulator layers, while the openings in the underlying, undoped silicon oxide components, of the composite insulator layers, do not increase in diameter.” (Abstract).

The subject matter of claims 36-39, 41, 44-47, 49, 51-54 and 59 would not have been obvious over Xing in view of Huang. Specifically, the Office Action fails to establish a *prima facie* case of obviousness. Not all limitations of independent claim 36 are disclosed, taught or suggested by the prior art references, whether considered alone or in combination. As discussed above Xing does not disclose, teach or suggest an “electropolished patterned metal layer having a thickness of approximately 50 to 300 Angstroms,” as recited by independent claims 36 and 44. Huang is cited for teaching a polysilicon upper electrode and does not supplement the deficiencies of Xing. For at least these reasons, Applicant respectfully requests the withdrawal of this rejection.

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In view of the above amendment, applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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